



COLONY OF SINGAPORE

ANNUAL REPORT OF THE BOTANIC GARDENS DEPARTMENT FOR 1957

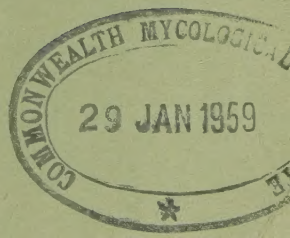
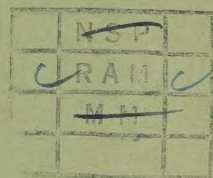
Rep. Bot. Gard. Dep. Singapore

PRINTED AT THE GOVERNMENT PRINTING OFFICE, SINGAPORE,
BY R. D. GILLESPIE, ACTING GOVERNMENT PRINTER

To be purchased from GOVERNMENT PUBLICATIONS BUREAU,
GENERAL POST OFFICE, FULLERTON BUILDING, SINGAPORE

1958

Price: \$1.50





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BY

H. M. BURKILL

*Director, Botanic Gardens
Singapore*

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CONTENTS

ADMINISTRATION

	<i>Paragraph</i>
I. Staff - - - - -	- 1- 6
II. Labour - - - - -	- 7- 8
III. Training - - - - -	- 9-10
IV. Botanic Gardens Ordinance - - - - -	- 11-12
V. Buildings and Roads - - - - -	- 13-16
VI. Visitors - - - - -	- 17-19
VII. Band Concerts - - - - -	- 20
VIII. Publications - - - - -	- 21-22
IX. Library - - - - -	- 23
X. Conferences - - - - -	- 24-25
XI. Plant Protection Service and Agricultural Pests Super- visory Committee - - - - -	- 26-27
XII. Imperial War Graves Commission Cemetery, Kraji -	- 28-31
XIII. Nature Reserves - - - - -	- 32-39
XIV. Meteorological - - - - -	- 40-41

BOTANICAL RESEARCH

XV. Collecting and New Records - - - - -	- 42-44
XVI. Exchange and Acquisition - - - - -	- 45-47
XVII. Taxonomy - - - - -	- 48-50
XVIII. Loans of Herbarium material - - - - -	- 51-52

HORTICULTURE

XIX. General - - - - -	- 53
XX. Gardens maintenance - - - - -	- 54-59
XXI. Government House Domain - - - - -	- 60-64
XXII. Horticultural exchange - - - - -	- 65-66
XXIII. Pests and Diseases - - - - -	- 67-70
XXIV. Orchids - - - - -	- 71-75
XXV. Succulents - - - - -	- 76

EXTENSION WORK

	<i>Paragraph</i>
XXVI. Trainees - - - -	77
XXVII. Sales, Plants and Publications - -	78-80
XXVIII. Exhibitions and Shows - -	81-86
XXIX. Singapore Gardening Society - -	87
XXX. Malayan Orchid Society - -	88
XXXI. Malayan Agri-Horticultural Association - -	89
XXXII. Malayan Nature Society - -	90
XXXIII. Advisory - - - -	91

APPENDICES

	<i>Page</i>
I. Staff - - - -	21
II. Meteorological Records (Orchid Enclosure) -	22
III. Meteorological Records (Gardens Office) -	23
IV. Meteorological Records (Summary) -	24
V. Institutions and Private Collectors from whom plants and seeds were received in 1957 - -	24
VI. Institutions and Private Collectors to whom plants and seeds were sent in 1957 - -	25

MAPS

Appended—Map showing Regional Place Names mentioned in this Report.

Inside front cover — Plan of Botanic Gardens, Singapore.

Inside rear cover — (a) Nature Reserves of Singapore.

(b) Plan of Government House Domain.

ADMINISTRATION

I. STAFF

THE YEAR was an extremely difficult one as regards senior staff and subordinate technical grades. The full complement of senior staff, attained for the first time for many years in 1955 and maintained in 1956, was seriously depleted by retirement under the terms of the Retirement from the Public Service (Compensation) Ordinance, 1956, and also by having officers sent overseas to acquire higher training.

2. Mr. J. W. Ewart, Curator, was compulsorily retired after 20 years service and left the Colony on 26th March for New Zealand. Mr. J. W. Purseglove, Director, opted to retire and left the Colony on 8th March to take up the Chair of Botany at the Imperial College of Tropical Agriculture, Trinidad. He had had 21 years' colonial service. These vacancies were filled by promotion. Mr. A. G. Alphonso, who was serving as Horticultural Assistant after successful completion in 1956 of a course of training at the Royal Botanic Gardens, Kew, was promoted Curator with effect from 26th March. Mr. H. M. Burkill, Assistant Director, acted as Director with effect from 8th March and was later confirmed in the appointment from that date.

3. Of the vacancies created by these promotions, only that of Horticultural Assistant was filled, by the appointment on 1st July of Mr. Lam Hin Cheng who was then sent overseas on 24th September to the Royal Botanic Gardens, Kew, to study for the Kew Diploma. The post of Assistant Director remained unfilled either substantively or by an acting appointment for the rest of the year. Mr. Chew Wee Lek, Botanist, was sent overseas to study for a higher degree at Cambridge University under Mr. E. J. H. Corner, at one time Assistant Director of Botanic Gardens, Singapore. Mr. Chew left on 18th September. Dr. C. X. Furtado, a re-engaged pensioner was away on vacation leave and no pay leave from 8th May to 13th November. Mr. Addison, Curator, was away from Singapore on overseas leave from 30th April to 21st December. Mrs. L. E. Lynas, temporary Librarian, resigned on 30th June. The post remained vacant for the rest of the year, but candidates were interviewed near the end of the year and it is expected that a selection will be made. Mr. Sinclair, Keeper of the Herbarium, remained on duty throughout the year, but was absent from Singapore from 1st June to 6th July on an important botanical expedition in North Borneo.

4. As a result of the absences and vacancies noted above, the duties of the nine topmost posts in the Department were covered for much of the year by but three officers, and in fact there was a period of over one month when there was no substantively confirmed officer in any of them on duty in Singapore. In addition to this Mr. Burkill acted as Agricultural Officer, Singapore, from 26th June to the end of the year.

5. In the subordinate cadres of the staff, Che Kiah bin Haji Salleh, Plant Collector, retired on reaching the age limit on 31st December after 37½ years' service. Che Ngadiman bin Haji Ismail, Head Ranger (Nature Reserves), was retired from service on medical grounds after 37 years' service.

6. A new venture in the recruitment of personnel must be recorded. On 24th April Mr. Lee Siew Luan was appointed Telephone Operator to

work a 3 x 9 switchboard. Mr. Lee had been blinded in an accident some years previously and had been trained as a switchboard operator at the Gurney School for the Blind in Kuala Lumpur. He has produced his own directory in braille of the more often required telephone numbers and can take messages on a braille typewriter. The experiment is proving quite satisfactory. Mr. Lee is the first blind operator to work in Singapore. Thanks are due to the Singapore Telephone Board for converting the Department's switchboard for operation by ear and touch, and to Mrs. E. Choy of the Singapore School for the Blind for various welfare services.

II. LABOUR

7. The labour force averaged 74 men, women and juveniles at the Gardens, 4 in the Herbarium, 55 in Government House Domain and 9 in the Nature Reserves. Health on the whole was good except that the epidemic of "Asian 'Flu" in May and of 'flu again in October caused sickness and absence from work. Eight overage labourers were retired and one labourer died. Average earnings of labour for the year were: Botanic Gardens \$4.43 per day, Government House Domain \$4.42 per day, Nature Reserves \$4.32 per day, Herbarium \$3.72 per day.

8. The labourers' lines were in general kept clean and tidy but the surroundings of the Indian lines had to be constantly sprayed with dieldrin to control flies and mosquitoes.

III. TRAINING

9. As recorded in paragraph 3, a botanist and a horticultural assistant were sent overseas for further training. The botanist, Mr. Chew Wee Lek, graduated B.Sc. Hons. from the University of Malaya in 1956. He was appointed Botanist to this Department on 1st October, 1956, the beginning of the University Year, and took up a course of post-graduate studies under the direction of Mr. E. J. H. Corner, University of Cambridge lecturer in botany and at one time Assistant Director of Botanic Gardens, Singapore, and under the supervision of the Professor of Botany, University of Malaya, and of the Director of Botanic Gardens. He went to England in September to continue his studies at Cambridge University on a Government Fellowship. He is working on the taxonomic relationship of *Moraceae* and *Urticaceae*. He is expected to return to Singapore in 1959 or 1960. The Horticultural Assistant, Mr. Lam Hin Cheng, graduated from the Serdang College of Agriculture in June with the diploma of the College. He joined the Department on 1st July and was sent in September to the Royal Botanic Gardens, Kew, England to study for the Kew Certificate. He will return to Singapore in 1959.

10. Under the "Training within Industry" scheme four officers of the Department attended courses of instruction.

IV. BOTANIC GARDENS ORDINANCE

11. When the Government took over responsibility of running the Gardens from the Singapore Agri-Horticultural Society in 1878, a committee of nominated members was set up under the Raffles Societies Ordinance, No. 7 of 1878, to control the Gardens' management. It met last in 1929 and it

had even then long outlived any usefulness it may ever have had. The last set of by-laws it issued was made in 1922 [No. 8395/22] and with the demise of the committee it became impossible to bring the by-laws up-to-date or to alter them in any way. In fact such by-laws as may have remained desirable were probably unenforceable in law. No committee, no by-laws. This nice legal tangle was resolved by the repeal of the Raffles Societies Ordinance and the enactment, so far as the Botanic Gardens were concerned, of the Botanic Gardens Ordinance, No. 32 of 1957, under which the Department is administered in the same manner as any other Government Department, the management and control being vested in the Director instead of in a Committee. The Ordinance received assent on 19th September.

12. The Ordinance authorises the appointment of officers to have the powers of a police officer within the Gardens, and a set of Rules for the management and control of the Gardens has been drafted and submitted for approval by the Chief Secretary and presentation to the Legislative Assembly.

V. BUILDINGS AND ROADS

13. There has been no change in any of the office buildings except that the "lower office" window shutters and louvres were sealed for air-conditioning. This room now houses about 40 per cent of the Department's library. The Assistant Director's house was redecorated inside and out and the roof tiles renovated. The Office Ring Road and the Main Gate Road were patched, but all the roads are showing signs of wear and need attention. The P.W.D. is expected to do this work next year.

14. The above items were done by the P.W.D. The following were carried out with Gardens' resources. The pergola with concrete pillars on Lawn O collapsed early in the year and was reconstructed with tanalised timber crossbeams. The propagating house on Lawn T was repaired and pot benches replaced. Two glass houses at the Potting Yard were temporarily repaired by the Gardens' carpenter and mason. One new orchid house was built using corrugated aluminium for the roof with "Perspex" skylights; a slatted flat roofed house for hanging strap-leaved Vandas was made and repairs were done to the slatted roof and benches for the orchid species collection in the old bear pits. The airconditioned glass house put up in the garden of the Director's quarters proved to be impracticable. By day it became a sun-trap and considerably more powerful equipment would be necessary to enable control to be exercised over its internal atmosphere. The airconditioning unit was condemned as beyond repair and the whole structure dismantled. The house itself was re-erected in the orchid enclosure for the expanding collection of succulents using the glass only for the roof and the upper part of the sidewalls.

15. Excavation for a large lily pond in the quadrangle of the plant house was begun.

16. The Gardens have no satisfactory perimeter fence and in the absence of any allocation of funds to construct one, a 5-strand barbed wire fence was put up. The boundary hedge has become very ragged with age and competition from nearby trees and is full of holes made or enlarged by urchins pushing their way through. Though the barbed wire fence will not keep out anyone determined to gain improper entry, it will discourage

the non-maliciously inclined. From 1st May entrance to the Gardens by car was by the Main Gate instead of by the Office Gate. The exit remained at the Office Gate. No visitors' traffic now uses the Office Ring Road except callers at the office.

VI. VISITORS

17. A large number of official visitors came to the Gardens, amongst them being Dr. Paul Surany, Entomologist, South Pacific Commission; Dr. S. Siddiqui, Director, C.S.I.R. Pakistan; Mr. C. W. Dixon, Commonwealth Relations Office, London; Dr. J. L. Murguia, Agricultural Scientist, Uruguay; Dr. G. Julén, Plant Breeder, Sweden; Mr. B. K. Thapa, Plant Nutritionist, Nepal; Professor G. Stokey, Professor Emeritus of Plant Science of Mt. Holyoke College, U.S.A.; Lady Veronica Sackville-West, Author, and Mr. Harold Nicholson, Author, England; Dr. Robert E. Lee, Professor of Ornamental Horticulture, Cornell University, U.S.A.; Prince Lak Kashemsanta, Department of Agriculture, Thailand; Dr. L. v. Olah, Professor of Genetics, Treub Laboratory, Indonesia; Lord and Lady Perth, London; Dr. G. F. Papenfuss, Phycologist, University of California, U.S.A.; Dr. R. F. Scagel, Phycologist, University of British Columbia, Canada; Dr. M. Doty, University of Hawaii; Dr. P. Bell, London University.

18. Many visiting research workers were afforded facilities for working in the Herbarium: Dr. E. F. Brunig and Mr. J. A. R. Anderson both of the Forest Department, Kuching, (forest trees); Mr. P. S. Ashton, Forest Department, Brunei (Dipterocarpaceae); Dr. A. A. Bitancourt, Instituto Biologica, Sa Paulo, Brazil (coffee diseases); Dr. R. E. Holttum (ferns, orchids); Mrs. B. E. Allen (ferns); Mr. T. C. Whitmore (Dipterocarpaceae) on a Commonwealth Welfare and Development Fund Fellowship; Professor H. B. Gilliland, University of Malaya (local flora); Dr. Bryce Douglas and Dr. Kiang Ai Kim of the University of Malaya (Phytochemical Survey); Mr. I. Enoch, University of Malaya (Aglaia); Dr. (Mrs.) A. Johnson, University of Malaya (Bryophytes).

19. As usual the Gardens were frequented by very many casual visitors, both local residents and from elsewhere. The arrival of luxury cruise liners was always marked by a tremendous influx of foreign visitors for whom traffic arrangements were made to permit a flow of taxis. It is a pity that many visitors with a genuine and active interest, either professional or amateur, in horticulture arrive unheralded without any appointment at the Gardens' Office. Visitors coming from overseas must usually know well ahead the expected date of their arrival in Singapore and a letter stating their interest and wish to call would be appreciated.

VII. BAND CONCERTS

20. Concerts were given on 14 occasions during the year by bands of the following regiments: 1 Rhodesian African Rifles, 50 Gurkha Field Engineer Regiment, 2 Royal Welch Fusiliers, 1 King's Own Scottish Borderers, 1 King's Dragoon Guards, 1 South Wales Borderers, 2/10 Gurkha Rifles, 1 Royal Lincolnshire Regiment, 1 Loyals, and 1/2 Gurkha Rifles. The Commanding Officers of these regiments and the General Officer Commanding Singapore Base District are thanked for their courtesy in permitting their bands to play. On Federation of Malaya Independence Day, 31st August, the Gardens were kept open till 10 p.m. and the band of the Far East Air

Force, R.A.F., gave an evening concert. The Commander in Chief, Far East Air Force, and the Director of Music are thanked for their kindness in sending their band from Changi for this special occasion. Whenever a band plays in the Gardens the number of visitors is always immensely increased. There is no doubt that these performances are greatly appreciated by the public.

VIII. PUBLICATIONS

21. An issue of the Gardens' Bulletin was prepared during the year and will be published early in 1958. The second edition of *Orchids of Malaya* by R. E. Holtum was published. Both this and *Malayan Orchid Hybrids* by M. R. Henderson and G. H. Addison are having a ready sale to the public not only in Malaya but in many countries of the world.

22. The following articles were published by members of the staff during the year:—

ADDISON, G. H.: Longevity in Orchid Flowers, *Malayan Orchid Review* 5 (1).

ALPHONSO, A. G.: Cultivation of Ferns, I, *Malayan Agri-Horticultural Association Magazine* 14 (1).

ALPHOSO, A. G.: Cultivation of Ferns, II, *ibid* 14 (3).

BURKILL, H. M.: Malayan Rubber, *Malayan Nature Journal* 12 (1).

PURSEGLOVE, J. W.: A bulbul's nest, a strange occurrence, *Malayan Nature Journal* 11 (3).

PURSEGLOVE, J. W.: Plants for the Amateur, II, *Mussaenda erythrophylla*, *Malayan Agri-Horticultural Association Magazine* 14 (1).

PURSEGLOVE, J. W.: History and Functions of Botanic Gardens with special reference to Singapore. *Tropical Agriculture* 34 (3).

IX. LIBRARY

23. The main part of the library continued to be housed in the building intended for the spirit collection, much of which has had to be boxed and is not conveniently available. The lack of proper and adequate accommodation is a serious handicap. Though the construction of a suitable building featured in the Development Programme for 1957, no allocation of funds was made available for it. By doubling up the senior staff into office space in the main office building, the lower office was cleared, fitted with airconditioners and iron racks were put in. These now hold the library overflow not housed in the spirit collection room. Previously these books had been kept on the upper floor of the herbarium where they were constantly exposed to damp and infestation of book vermin. Twenty-five books were added to the library, but the main source of accession remains exchange with other institutions. Reciprocal exchange operates with 186 organisations.

X. CONFERENCES

24. The Ninth Pacific Science Congress was held at the Chulalongkorn University, Bangkok from the 18th to the 30th November by invitation of the Government of Thailand to mark the year 2,500 of the Buddhist Era. It was extremely well organised, and was well attended by scientists from all the major countries of the world including all the countries of South-east Asia. Mr. H. M. Burkill went as a Singapore Government delegate, and in the Botanical Section was convenor of one symposium "Problems confronting

tropical botanical institutions" in which papers by Mr. Purseglove ("A brief history of Botanic Gardens with special reference to Singapore") and himself ("Some current problems of the Botanic Gardens, Singapore") were presented. Mr. Burkill also attended the section on Conservation in which he read another paper ("A Survey of Nature Conservation on Singapore Island.").

25. No representative of the Singapore Government was able to attend the meeting of the Plant Protection Committee held at Kandy, Ceylon, in December, and the interests of this Government were cared for by the representatives of the Government of the Federation of Malaya. Nor was there any representative from this Department at the Third Pan-Indian Ocean Science Congress held in Madagascar in September.

XI. PLANT PROTECTION SERVICE AND AGRICULTURAL PESTS SUPERVISORY COMMITTEE

26. The Borneo Territories turned down a regional scheme for a plant protection service and plans on a pan-Malayan basis were agreed between the Governments of Singapore and the Federation of Malaya. Singapore will meet 27 per cent of the cost and the Federation 73 per cent. The Service will be based on Singapore and the staff will be on the establishment of this Department. Recruitment of a locally-domiciled honours graduate in agriculture or botany proved impossible owing to the lack of suitable candidates. Arrangement in principle has however been made that a selected person will be attached to the Australian Plant Quarantine Service for one year to undergo training. In the meantime requests have been made under international aid agreements for an "expert" to initiate the service.

27. Mr. Purseglove served on the Agricultural Pests Supervisory Committee established under the Agricultural Pests Ordinance, No. 37 of 1952, up to 7th March. Mr. Burkill served from 7th June and was Chairman from 26th June.

XII. IMPERIAL WAR GRAVES COMMISSION CEMETERY, KRANJI

28. Work was concentrated during January and February in turfing as much as possible of the grounds with a fine-leaved *Zoysia* sp., giving a dense but springy mat, in preparation for the official opening ceremony in March. The permanent staff of 1 caretaker and 13 gardeners was augmented by 24 extra labourers and by the end of February one third of the grounds had been so turfed, the rest remaining under *Axonopus compressus*.

29. His Excellency the Governor, Sir, Robert Black, K.C.M.G., O.B.E., declared the Cemetery and War Memorial officially opened on 2nd March. The ceremony was attended by a large crowd of people from Singapore, Malaya, the Commonwealth and late allied and enemy countries. The Botanic Gardens supplied extra pot plants for the occasion. During the year over 29,000 visitors are estimated to have come to the Cemetery. In March there were 15,020 visitors.

30. The work of returfing with *Zoysia* was continued for the rest of the year. It is a small but noteworthy disability of this strain of *Zoysia* that it carries a considerable quantity of dead herbage below its topmost growth

and in close cutting this is exposed leaving a lawn brown in patches. Recovery is quick as new growth soon covers it up. (See also para. 70). Over 2,500 flowering shrubs were planted, most of them for decoration in the headstones border.

31. Though the Botanic Gardens are responsible for supervision of the cemetery, the horticultural policy is decided by the Imperial War Graves Commission whose horticultural officers, stationed at New Delhi, India, pay frequent visits. Funds for the upkeep of the cemetery are provided by the Commission in whose reports more detail may be found.

XIII. NATURE RESERVES

32. The Board of Trustees consisted of:—

- | | |
|---|--|
| Nominated by the Governor-in-Council | 1. Mr. E. Galistan. |
| | 2. Inche Yusof bin Ishak. |
| Nominated by the Minister for Local Government, Lands and Housing | 3. Mr. M. W. F. Tweedie, Director, Raffles Museum (to 11th July).
Mr. Tan Hoon Siang (from 17th September). |
| | 4. Professor H. B. Gilliland, Professor of Botany, University of Malaya (on leave of absence, 2nd June to 12th September).
Dr. D. S. Johnson, Department of Zoology, University of Malaya (<i>vice</i> Prof. Gilliland, 2nd June to 12th September). |
| Nominated by the City Council | 5. Mrs. Amy Ede (to 7th December). |
| Nominated by the Rural Board | 6. Mr. A. L. B. Swaine. |
| Chairman (<i>ex-officio</i>) | 7. Director of Botanic Gardens—
Mr. J. W. Purseglove (to 7th March).
Mr. H. M. Burkill (from 8th March). |

33. Mr. Tweedie and Mr. Purseglove left the Board of Trustees on retirement from Government Service. Mr. Tweedie had served the Board since its first constitution on 29th June, 1951. The periods of nomination to the Board of Mrs. Ede and Mr. Swaine expired during the year, and both were reappointed. Mrs. Ede later ceased to be a Trustee on expiry of her term of office as a City Councillor on 8th December. Mr. Swaine is the only present trustee who has served since its inception.

34. The trustees held six meetings during the year.

35. The Legislative Assembly resolved on 4th December that the Pandan Reserve be reduced from 1,373 to 370 acres,* though the reduction was strongly opposed by the Board.

36. A fibre-glass dinghy and an outboard engine were bought for use in the Pandan Reserve, but the employment of labour (see Annual Report 1956) was held in abeyance, pending a decision on the reduction of the reserve.

37. Work in the other reserves has gone on normally, much attention being given to Bukit Timah. Three direction posts were erected on the public high-way indicating the main entrance to the reserve. The look-out points

* Since increased to 542 acres.

have all been renovated. Notice boards advising that the area is a nature reserve were put up; also maps in "Perspex" fronted holders. Both the notice boards and holders suffered damage by hooligans, and one map was stolen. As the Board works on a tight budget, continuous and extensive damage cannot be made good so that irresponsibility and selfishness of a few may have repercussions on the pleasure of the many welcome visitors who respect the spirit of the reserves.

38. The three rangers and nine labourers on the Board's pay-roll were at work throughout the year. The Head Ranger was on medical (T.B.) leave from 1956 to the end of this year when he was retired from service by medical board. The labourers' quarters at Bukit Timah were completely renovated by the Public Works Department.

39. Quarrying at Bukit Timah is a constant source of alarm and during the year there were two instances of quarry encroachment as a result of which lengths of the reserve boundary path were blasted away. The recommendations of the Select Committee on Granite Resources and Nature Reserves on Singapore Island (Command White Paper No. 6 of 1951, Colony of Singapore) regarding Lot 67/31, lying within the Bukit Timah Reserve on which stands the Bukit Timah Bungalow, were that on expiry of the lease it should be incorporated within the Reserve. The lease was terminated on 31st December, 1954, and the Board applied for possession (see paragraph 67 of the Annual Report for 1955). In 1957 the land was allocated to the Telecommunications Department on condition that the public would be given access to what is one of the finest viewpoints on the Island.

XIV. METEOROLOGICAL

40. Observations were continued at the meteorological stations at the office and in the orchid enclosure. Records are tabulated in the Appendix. The rainfall in 1957 (78.50 inches) was the lowest, except in 1941 (76.96 inches) for any year since 1914 when reliable records were first taken.

41. The pattern of rainfall in Singapore appears quite unpredictable and any month may be the wettest or the driest for the year. Rainfall in January, for instance, was 2.50 inches in 1944 which was the driest month of the year and was the driest January for the period 1914-57, but in 1951 it was the wettest for the year and the period with 22.49 inches. The only certainty is that no month is ever completely dry.

BOTANICAL RESEARCH

XV. COLLECTING AND NEW RECORDS

42. With an increase in the vote for plant collecting, it was possible to increase the number and range of expeditions. Not counting the many single day forays into the Singapore Nature Reserves and countryside and into Southern Johore, the following expeditions were made:—

J. W. Purseglove and Md. Shah bin Haji Md. Nur	Bako National Park, Sarawak	2-18/2	136 nos.
H. M. Burkill	Pulau Satumu (Raffles Light), Singapore	30/1-3/2	17 nos.
H. M. Burkill	Pulau Senang, Singapore	2-6/8	10 nos.
H. M. Burkill	Malacca	19-20/4	20 nos.
H. M. Burkill	Fraser's Hill, Pahang	30/4-4/5	56 nos.
H. M. Burkill	Kanburi, Thailand	25-27/11	64 nos.
J. Sinclair and Kadim bin Tassim	Mt. Kinabalu, Ranau and Sepilok Forest, Sandakan, North Borneo	1/6-6/7	416 nos.
J. Sinclair	Malacca	20-21/4	14 nos.
J. Sinclair	Mersing, Johore	4-5/12	6 nos.
Chew Wee Lek and Kiah bin Haji Salleh	Trengganu, Kelantan	27/3-11/4	32 nos.
Chew Wee Lek	Pulau Langkawi and Perlis	10-25/5	14 nos.
Md. Shah bin Haji Md. Nur	Fish Culture Research Sta- tion, Malacca	5-10/5	60 nos.
Md. Shah bin Haji Md. Nur	Nilai, Negri Sembilan	17-24/9	82 nos.

This opportunity is taken to acknowledge the help given Departmental officers on these collecting trips. Thanks are due to Dr. E. F. W. Brunig, Forest Department, Sarawak, and Mr. T. Harrisson, Sarawak Museum, Mr. G. Seidenfaden, Danish Ambassador to Thailand, Nai Tem Smitinand of the Royal Thai Forest Department, Mr. G. L. Carson, Mr. D. J. Nicholson and Mr. F. V. Webster of the North Borneo Forest Department, Mr. K. H. Bryant, State Forest Officer, Kelantan and Trengganu, Mr. J. Wyatt-Smith, State Forest Officer, Kedah and Perlis, Dr. G. Prowse of the Fish Culture Research Station, Malacca, and Mr. D. R. Maw, Manager, Jindaram Estate, Nilai.

43. A considerable amount of valuable and interesting material was collected during these trips. Mr. Purseglove accompanied by Professor Gilliland, Professor of Botany, University of Malaya, completed a preliminary botanical survey of the new National Park situated at the mouth of the Kuching River. Mr. Burkill continued his observations on algae at Raffles Light and neighbouring islands, collected algae at Malacca and, since he was on casual leave and travelling without collecting equipment, his numbers at Fraser's Hill were mostly Bryophytes which presented no technical complications of preservation. The collecting trip in Thailand was made during an interlude in the Ninth Pacific Science Congress in Bangkok in a locality 30-50 kilometers north of Kanburi (Kanchanaburi) in the foot hills of the Menam-Meklong watershed. Mr. Sinclair's visit to North Borneo was primarily to study *Myristicaceae* but a very rewarding general collection was made. An account of this trip will appear elsewhere. His collecting at Malacca and Mersing was done on casual leave. Mr. Chew Wee Lek collected *Moraceae*

and made pickled specimens for his studies at Cambridge University. 'Che Md. Shah's collecting has been one of sampling the vanishing vegetation. At the new Fish Culture Research Station pond site, flora was collected prior to initial flooding, and at Nilai the primary forest, being felled for rubber planting, was collected over. In this he found two hitherto undescribed species of *Annonaceae*. This is a rather soul-searing form of botanical study but with the extensive acreages of primary jungle being felled in Malaya it is considered desirable to know what was there even if it may now no longer exist. The Department is extending this aspect of collecting and a programme of work at areas of forest felling in Malaya will be carried out in 1958.

44. As already indicated new records were found during this work. In the relatively little known flora of Sarawak and North Borneo, novelties and species poorly represented in herbaria were collected. New records for Malacca are *Rotala indica*, *Drymaria cordata*, *Lindernia sessiliflora* and *Rotala leptopetala* var. *pentamera* which is also new to Malaya. New for Johore are *Scirpus squarrosus*, *Polygala paniculata*, *Litsea sebifera* (planted two miles north of Simpang Rengam on the main trunk road), *Halophila spinulosa*, a marine Angiosperm found in the Johore Straits. New to Singapore are *Dipterocarpus kunstleri* and *D. sublamellatus*. Another new record will serve to show how the amateur may add to scientific knowledge. A British serviceman on patrol against terrorists in a tin mining area near Siputeh in Perak collected a plant of *Oldenlandia* which cannot be matched in the Herbarium. It is undoubtedly a new record for Malaya, if it is not a new species.

XVI. EXCHANGE AND ACQUISITION

45. 9,438 duplicates were distributed to other botanical institutions in 1957. This is by far the greatest number ever sent out except in 1947, when some 10,733 sheets were dispatched. The present number consisted both of specimens collected during 1957 and older specimens accumulated over the years. Some unnamed pre-war specimens have now been determined and will be distributed next year. Storage space is limited, and it will ease the congestion if more of these can be distributed.

46. 2,544 duplicates were received in exchange from outside institutions during the year. This was less than last year when the number was 6,768, but in the long run a fair balance is struck. These acquisitions are gratefully acknowledged. Although everyone cannot be mentioned by name the following were among the principal contributors:—Herbarium Bogoriense; Royal Botanic Garden, Edinburgh; Forest Departments of Lae, Sarawak and North Borneo; British Museum; Rijksherbarium, Leiden; the Forest Research Institute, Kepong and the University Andalas at Pajakumbuh, Sumatra. In addition, some 53 sheets were received from Vientiane collected by Mr. L. G. Holliday, His Excellency the British Ambassador to Laos.

47. As a result of domestic collections by officers of the Department and from exchange duplicates received and mounted, 6,016 sheets were laid-in in the herbarium. Eight new cabinets were bought, four for palms and four of the general size.

XVII. TAXONOMY

48. Mr. Sinclair completed his revision of the Malayan *Myristicaceae* (Nutmeg family) and the text was submitted for printing in volume 16 of the *Gardens' Bulletin*. This Bulletin has several papers of significant interest and will be published early in 1958. Mr. Sinclair continued his studies on the *Myristicaceae* by extending the field to the whole Malaysian region for a

revision for the Flora Malesiana. This work may take another four years. The first genus to be tackled was *Gymnacranthera*, but the lack of staff to share routine duties delayed progress. Some time was spent on the other genera in this family, especially annotating the sheets sent on loan and in separating the difficult and critical sheets from the simpler ones which are no longer required for study. As some of the herbaria wish their specimens to be returned quickly, it was thus necessary to spend time on a preliminary sorting out of the sheets available for only a limited time, and to examine them first. Some sheets, however, will have to be retained so that they can be compared with yet other sheets, mostly types or isotypes, from Florence, Paris and Kew which are not at hand at present.

49. Mr. Chew Wee Lek began preliminary investigation into the *Moraceae* (Fig family) which he will continue at Cambridge while working for a higher degree.

50. Routine herbarium work continued with drying, poisoning and mounting new specimens, repairing damaged sheets of old specimens, and identification of collections. Most of the material collected by officers of the Department during the year was determined, or, if it could be identified here, was sent to experts elsewhere. Acknowledgement is made of the help these persons have given. A very large quantity of unnamed specimens has been received from North Borneo, Sarawak, New Guinea and other countries for determination but little progress has been possible with the depleted botanical staff and those on duty diverted to administrative routine. A welcome development has been an increased interest shown by schools, teachers and pupils sending specimens for naming, some crushed and battered beyond recognition but the intention is good and it is hoped the Education Department will do all in its power to foster this interest. The more people there are with an active and intelligent appreciation of the flora (and fauna), the greater the need for effective nature conservation on a permanent basis.

XVIII. LOANS OF HERBARIUM MATERIAL

51. 4,174 sheets were sent on loan for study as against 4,525 in 1956. The majority went to Leiden and the principal families asked for were *Connaceae*, *Cyperaceae*, *Lycopodiaceae* and *Rhizophoraceae*. These are for Flora Malesiana revisions.

52. A total of 3,182 sheets of *Myristicaceae* (Nutmeg family) from 19 different herbaria was sent on loan to the Keeper of the Herbarium in connection with his study on that family for "Flora Malesiana". Each sheet is being examined and labelled with the correct name as far as possible, or if there is difficulty, a provisional name is given. The Directors of those herbaria sending material here are thanked for their kind co-operation. In many cases their material has helped to solve difficult problems. These loans are not however entirely one sided for our own interest, as the lending institution benefits by receiving back their material correctly named according to current taxonomic ideas.

HORTICULTURE

XIX. GENERAL

53. It is with regret that the death is recorded of Mr. Lim Hong Hee at the age of 63 years on 1st November. Mr. Lim started his career as a transmission clerk of Messrs. Cable and Wireless. He lost this employment during the worldwide slump in the early 1930's, and set up on his own as a nurseryman. His business, The Gem Nurseries, developed into a progressive concern through pioneering, perseverance and perspicacity. Mr. Lim was amongst the early horticulturists to introduce foreign orchid stock and to raise his own material. He was certainly the first local nurseryman to send orchid blooms overseas by air. Commercial nursery gardening in Singapore owes much to him.

XX. GARDENS MAINTENANCE

54. All the lawns were maintained in good condition. With two extra Hayter motors in use it was possible to keep the remotest parts of the Gardens including the Arboretum and Lawn Z well cut. The Gardens have about 40 acres of grass and use the following mechanical equipment to cut it on weekly rotations:—Dennis 24 inch cut—3, Aveling—Barford "Atom" motor scythe—1, Hayter rotor scythe 24 inch cut Villiers 4 stroke engine—2.

55. Routine planting was carried out in the beds. Some 120 plants were put out as individual plantings. Eighteen new beds and borders mostly on Lawn O were made. Over 500 plant labels were made or repainted. There continues to occur in the Gardens the time-old trouble of misplaced and mixed labels. The culprits undoubtedly are Primates, but by no means are they confined to the resident longtailed macaque monkeys (*Macaca irus*). Liberal application of Sterameal, cow dung and artificials such as Sulphate of Ammonia, N.P.K. mixture and rock phosphate were given to all beds. Also considerable quantities of compost were made from lawn sweepings and plant debris.

56. When the wall was built around the southern end of the lake in 1956 the water was drained away and many of the aquatic plants were killed. In anticipation of completion of the wall around the northern end no replanting was done. It now seems certain the wall will not be completed at all in the near future.

57. A huge *Ficus retusa* tree was blown down in the northern end of the lake smothering a part of the rockery of aroid and marantaceous plants. As much of the tree was in the lake itself its recovery without causing damage to the rockery was a difficult task. Altogether 11 trees died or had to be cut down. Two *Casuarina sumatrana* and a willow (*Salix* sp.) sapling were planted near the lake.

58. The bamboo collection on Lawn W was checked and labelled.

59. The quantity of fish in the lake is a constant source of amazement. True the public feeds them with great amounts of bread but this can only be a small fraction of their total diet. This is a good object lesson of the potential fruitfulness of fresh water ponds as a source of food. The Lake contains golden carp, catfish and *Tilapia*. There are also possibly as many as six Malayan Mud Turtles (*Trionyx cartilagineus*).



A river scene on the Sungei Jurong at half tide. Left and right edges, bushes of *Rhizophora conjugata*;

PANDAN NATURE RESERVE

In a main channel—near the sea.



Avicennia
alba

Scyphiphora
hydrophyll-
lacea

other vegetation mainly
Rhizophora conjugata

On the Tanjong Penjuru Road—inland.



Regenerating mangrove of larger stature than on the coastal fringe. Earth lumps on roadside thrown up by a burrowing prawn (*Thalassina* sp.) in making ventilation chimneys.



PANDAN NATURE RESERVE

Foreshore vegetation near low tide. Stilted plants of *Rhizophora conjugata*, seedlings in foreground of *R. mucronata*, and air-roots of *Avicennia* in the exposed mud.



BOTANIC GARDENS' LAKE



Mussaenda philippica var. *Dona aurora*

An extremely showy variety of a Philippine species in cultivation in the Botanic Gardens.
The enlarged sepals are creamy white and up to 3-4 inches long.

XXI. GOVERNMENT HOUSE DOMAIN

60. The grounds were maintained in good condition throughout the year. A Hayter motor scythe proved very useful in trimming roadside verges and small areas unworkable by normal mowers. The Ransome Gazelle has been found excellent for mowing slopes and banks, some of them quite steep. The additional mechanical equipment brought into use released labour for work on the outlying parts of the Domain. The area on the north-east side hitherto not cuttable by machine was graded and many small self-sown saplings were removed.

61. During the year all young trees and shrubs which had been recently planted were manured. The *Stenolobium stans* in front of Government House received special attention and amply repaid the extra care by flowering six to seven times. This particular plant responds extremely well to heavy manuring, both in growth and in freedom of flowering. *Bougainvilleas* which are also a feature of the Domain around the house require much less manuring with the exception of *B. poultoni* which responds as well as does *Stenolobium stans*. All the Canna beds at Government House, Chief Secretary's House, Under Secretary's House and Attorney-General's House as well as the beds in the nursery were replanted once during the year. The hedges, particularly those near the IN & OUT Roads and the *Baphia* hedge near the second gate were heavily manured, the latter twice. Compost heaps were maintained, the general gang spending two or three days per month making them. There were complaints from the Health Department about fly breeding, but these were eventually kept under control by using "Agrocide." The chief reason why flies breed in the compost heaps is that poultry by their constant scratching prevent the compost heaps from heating correctly. Spent hops were collected weekly from the breweries and cattle manure when available from the quarantine station. Large quantities of elephant dung were obtained for the first time; it was found good as an activator in composting. Burnt soil was made monthly.

62. The beds of orchids in the nursery were extended. Amongst the varieties grown, the chief type is *Arachnis* Maggie Oei; there are also a number of beds of *Vanda* Miss Joaquim, *Vanda* Amy and various *Arandas*. A number of orchid beds were planted in the potting yard enclosure so that there might be better control over cutting blooms. The potting yard benches were changed in a number of cases to chengal (*Balanocarpus heimii*), replacing the kapor (*Dryobalanops*) which rots quickly.

63. The gardens in front of Government House, at the Chief Secretary's House, the Attorney-General's House, the Under Secretary's House and the new garden were kept cut and tidy with no major alteration taking place. Five large *Bougainvilleas* were replaced with *Congea velutina*. The *Mucuna* on the pergolas in front of the house deteriorated and two new ones were planted as possible replacements if and when the old one dies. *Mucuna bennettii* does not seem to like short mown turf around its roots; it was much better before the rockery beds around it were levelled and laid down to grass.

64. The kitchen garden produced salad vegetables, bayam (*Amaranthus*), long beans (*Vigna sinensis*), brinjals (*Solanum melongena*), artichokes (*Helianthus tuberosus*) and lady's fingers (*Hibiscus esculentus*). There has been some difficulty in getting watercress to grow well in this site; trials are being made at the potting yard enclosure but it is not known yet whether these will be successful. Beds of *Canna*, *Gerbera*, *Gladiolus*, *Artemesia* and various other herbaceous plants were maintained for use as cut flowers.

XXII. HORTICULTURAL EXCHANGE

65. Seed and plant exchange with botanical, horticultural and pharmaceutical institutions throughout the world was maintained. 514 packets of seeds and 273 plants or planting materials were received, and 473 packets of seed and 198 plants or planting materials sent out. Lists of donating and receiving addresses are given in Appendices V and VI. One of the most commonly requested items for exchange is palm seed. The Gardens has one of the largest collections of palms extant, but our efforts to fulfill requests for seed have been seriously frustrated by the depredations of monkeys, who failing to obtain adequate food from the public, for whose delectation alone they are allowed to remain, or from the forest trees in Gardens' jungle, have recently taken to plucking the unripe palm seed as a source of food. (See also para. 67).

66. Amongst the newly introduced plants now established, a variegated form of *Ficus elastica* and a beautiful *Gloriosa rothschildiana* are most noteworthy.

XXIII. PESTS AND DISEASES

67. There is only one serious pest and that is the vast number of monkeys inhabiting the Gardens and Tyersall Park. There are other pests, it is true, but measures to deal with them can be taken without affront to public opinion. Thus the monkeys are not merely a pest, but also a problem of public relations. One attempt to dispose usefully of those who would let themselves be caught brought swift reaction from a number of sentimental persons with nothing better to do than to be difficult. On another occasion a hired trapper was involved in a brawl with a stalwart citizen of Singapore who was prepared to come to the monkey's aid with fisticuffs. Thirty-five years ago the monkey population was estimated to be about 100. Now there are about 300 divided into three main troops. They were certainly reduced in numbers during the war years 1942-45, but their present rate of increase must surely match that of Singapore's own population. Little enough damage is done on a Saturday afternoon and on a Sunday when the whole population hangs around the most frequented parts of the Gardens awaiting feeding. Their week-end gorging lasts them for a couple of days longer and then a bleak mid-week period begins. Occasionally there may be forest trees in fruit in the Gardens but more often there is inadequate natural food available and in their quest for substitute food extensive horticultural damage is done. Twelve monkeys were shot during the year and six caught, but considerably stronger measures will have to be taken to limit their numbers.

68. Damage to the palm collection by the Rhinoceros beetle (*Oryctes rhinoceros*) continues. The damage is shown by the perforations of the leaves and petioles. Palms affected were *Phoenix*, *Licuala*, *Oreodoxa* and especially *Corypha*. Some measure of control was obtained by inserting para-dichlorobenzene crystals into the holes and plugging them with mud. Preventive measures by collecting the grubs from their nursery sites are the best. On one occasion over 1,000 grubs were collected. More serious damage has been done by the Red Stripe weevil (*Rhynchophorus ferruginea* var. *schach*). Two *Sabal palmetto* and three *Phoenix rupicola* have been killed and several trees disfigured. The larvae of this pest attack the growing point of the palm cabbage, and eventually the fronds fall off leaving a bare trunk. Control was attempted by spraying with Agrocide and Dieldrin but no satisfactory solution has been found as the symptoms of attack are revealed too late to save the plant.

69. A large quantity of larvae of the Rhinoceros beetle were supplied to the Entomological Section of the South Pacific Commission to assist in a biological control project on this serious pest in the South Pacific area.

70. During the year difficulty was experienced at the Kranji War Cemetery with a fungus attacking the *Zoysia* turf causing brown patches and rings. The pathogen was identified by Mr. A. Thompson of the University of Malaya as *Helminthosporium oryzae*, a weak parasite of grasses causing "Leaf spot" of rice. It is not a serious disease but its appearance is most prevalent during prolonged wet weather when lawns become covered with unsightly brown areas of infestation. A number of fungicides have been tried to control the fungus but with partial success only. If a satisfactory control can be obtained and a convenient method of husbandry worked out to avoid brown patches on mowing, this grass should find extensive use for growing especially high quality turf. It is not yet known whether the grass will stand up to much treading, and it would be premature to try it on a large scale in areas liable to wear.

XXIV. ORCHIDS

71. The half of the enclosure inside the security fence now given over to orchid cultivation will have to be extended into the other half displacing the plant introduction nursery to elsewhere, probably to a site to be prepared on Lawn X. Fourteen new beds were made for planting out half-grown new orchid hybrids. All orchid beds received heavy mulching, most of them being mulched and replanted 2-3 times during the year.

72. Many plants were received on an exchange basis. The firms or individuals concerned were Mr. Boey Cheng Heng, Mr. A. J. Braga and Coronation Nursery, Nam Kee Nursery, Seng Heng Nursery and T.M.A. Orchids Ltd. Dr. Womersley of the New Guinea Forest Department supplied some interesting species and seed. Seed was also received from various individuals for sowing and raising on the basis of a proportionate return of the seedlings to the donor. Amongst interesting plants to be introduced were *Vanda Kono*, *V. Afterglow*, *V. Ernest Fuginaga*, *Dend. Lady Hamilton* and *Dend. Waikiki Beauty*, but the most outstanding plant obtained was *Vandanthe Tomas Felipe Camache* from Seng Heng Nursery.

73. With staff shortage, less hand-pollination was done. Fifty-four crosses were made, of which 20 set seed. These were sown in addition to the 50 pods presented to the Gardens by local people, as well as pods from New Guinea, Australia, New Zealand, Barbados and America. The number of orchid hybrids which flowered for the first time was 21, 11 of which not previously named appear at the beginning of the list which follows: 1093: *Arachnis hookeriana* var. *luteola* × *Renanthera monachica* (*Aranthera Dainty*); 1451: *Dendrobium Constance* × *Dend. champagne* (yellow); 1597: *Dend. Lim Chong Min* × *Dend. Mauna Kea*; 1319: *Arachnis flosaeris* × *Vandanthe Ellen Noa*; 977: *Arachnis Ishbel* × *Vandanthe Ellen Noa*; 1472: *Aranda Gold Star* × *Vandanthe Ellen Noa*; 984: *Arachnis Maggie Oei* × *Trichoglottis fasciata*; 1226: *Vanda Gilbert Triboulet* × *Aranda Catherine*; 920: *V. Kapoho* × *V. Gilbert Triboulet*; 1256: *Arachnis hookeriana* × *Vanda Saphir*; 909: *Vanda luzonica* × *V. Gilbert Triboulet*; 1000: *Arachnis hookeriana* × *Vanda caerulea* (Queen of Purples); 1472: *D. Colin Potter* × *D. phalaenopsis*; 1501: *Neo-Hawaii* × *D. phalaenopsis* var. *hololeucum* (*D. Lelia Camp*); 1281: *D. Champagne* × *D. Constance*; 2104: *D. Sarie Marijs* × *D. hololeucum* (*D. Marissa*), 1742: *D. undulatum* × *D. alba* (*D. Pauline*); 1840: *Vanda Josephine van Brero* × *Vandanthe tatzeri* (*Vandanthe*

Howell Mundell); *D. Ursula* × *D. phalaenopsis* (D. Ellen Harris); 1059: *Arachnis Maggie Oei* × *V. tricolor* v. *sauvis* (Aranda Bertha Braga). Of the foregoing the following are worthy of special mention: 984, a good shaped flower borne on sprays of 1½–2 ft. long. Up to 10 flowers are out together, each flower being yellow with dark brown or brown-red transverse bars, but it is not free flowering in Singapore; 1093 *Aranthera Dainty*, 10–15 flowers are borne on inflorescences 1½–2 ft. long. The flower colour is delicate pink-red with spots and bars of a darker hue. Seedlings flower when only 10 inches high; 1472, as in all *Vanda spathulata* progeny this closely follows the female parent. The most noteworthy point of this hybrid is that it is an Aranda cross which at the best of times is unusual. The flowers are small round and flat with leaves almost copper coloured; 1840 *Vandanthe Howell Mundell*, raised from seed obtained from Mr. H. S. Tan, very similar to *V. Tan Chay Yan* but not quite as good a shape.

74. In the laboratory, experiments in the use of coconut milk in orchid media, initiated late in 1956 continued during the year. The agar was impregnated with 13 different treatments:—

- (1) Vacin's culture prescription and 100 per cent young coconut milk.
- (2) Vacin's culture prescription and 100 per cent mature coconut milk.
- (3) Vacin's culture prescription and 50 per cent young coconut milk.
- (4) Vacin's culture prescription and 50 per cent mature coconut milk.
- (5) Vacin's culture prescription and 25 per cent young coconut milk.
- (6) Vacin's culture prescription and 25 per cent mature coconut milk.
- (7) Vacin's culture prescription and 100 per cent young coconut milk and fish emulsion.
- (8) Vacin's culture prescription and 100 per cent mature coconut milk and fish emulsion.
- (9) Agar-Agar and 100 per cent young coconut milk.
- (10) Agar-Agar and 100 per cent mature coconut milk.
- (11) Vacin's culture prescription and fish emulsion.
- (12) Agar-Agar and fish emulsion.
- (13) Vacin's culture prescription (control).

Treatments are not replicated for statistical interpretation but from observation treatment 5 gives promising results with the largest and healthiest seedlings. Treatment 13 appears next. Treatments 7, 8, 9 and 10 had bad results.

75. For many years it has been noticed that some flasks sown and treated in the usual way produced spherical deformed plants of a morbid appearance. Under microscopical examination the tissue was seen to be a proliferating mass of undifferentiated cells suggestive of a carcinoma. One flask, containing such seedlings was sent to a cancer research hospital in New York, but the flask failed to stand the journey. Professor Gilliland of the University of Malaya has examined them and confirms our own opinion that the plants affected can grow out of this condition. It is possible that sowing too thickly may be a cause but it is curious that when it occurs it will be found in all the flasks containing seed of the same cross and sowing.

XXV. SUCCULENTS

76. Little addition was made to the range of the succulent collection. The most interesting one was *Epiphyllum ackersmannii*, a close relative of the well-known "Kheng-fa", *E. hookeri*, Haw. It has a deep red flower which opens during the day instead of at night as does Kheng-fa.

EXTENSION WORK

XXVI. TRAINEES

77. The Gardens offer facilities for training a limited number of persons as Gardeners. During the year trainees were accepted from the Public Works Department—4, The Rehabilitation Section of the Labour Department—4, and one from the Shell Oil Coy, Seria, Borneo. They came to the Gardens for 4–6 months.

XXVII. SALES

78. A total of 25,611 plants, bulbs and cuttings were sold to the public, 4,852 were orchid plants and 385 succulents. This is a smaller total than in the three previous years but because of the increasing demand for and sale of orchid plants commanding much higher prices than other plants, the revenue from plant sales was the greatest yet recorded. The sales for the past five years are summarised in the table below:—

Year		SALES						Total	
		Garden Plants		Orchids		Succulents			
		No.	\$	No.	\$	No.	\$	No.	\$
1953	..	12,330	6,456	2,787	11,072	..	..	15,117	17,528
1954	..	24,057	7,496	2,740	11,920	..	..	26,797	19,416
1955	..	24,224	5,302	2,730	16,005	874	880	27,828	22,187
1956	..	25,666	4,008	3,446	22,759	426	478	29,538	27,245
1957	..	20,374	3,795	4,852	28,209	385	284	25,611	32,288

It is clear from the trend shown in this table how quickly the popularity of orchids is increasing. During the year a large number of unflowered orchid seedlings were released for sale, and the orchid enclosure in the Gardens witnessed scenes reminiscent of the bargain clearance sales of the big emporia in the town, but acted by a predominately male cast. Here-to-fore orchid sales had been conducted from 3–4 p.m. on Mondays to Fridays, but the progressive increase in time taken by a technical officer of the Department in attending to this matter called for some urgent rearrangement. Many of the persons coming ostensibly to buy orchid plants or cuttings took the opportunity of wandering around looking at the flowers, wasting the officer's time. Some took the opportunity of filching near ripe hand-pollinated seedpods and a number of pods were lost in this manner. 3–4 p.m. became stretched to 2–5 p.m. Therefore from September sales in the enclosures ceased. Planting material as it becomes available is now taken to the potting shed for sale from 8 a.m.–2 p.m. on Mondays and is sold along with other planting material.

79. The Gardens continued to supply planting material free of charge to Singapore Government Departments, charitable institutions, the University of Malaya and the Services. The P.W.D. took the biggest requisition for planting in new school compounds and at official quarters. Over 8,000 plants and cuttings were supplied to these different organisations.

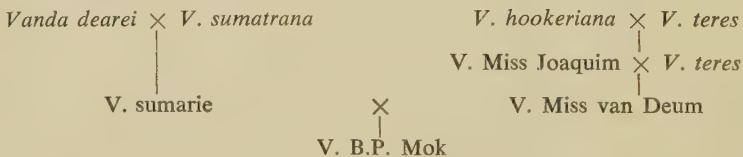
80. The sale of Gardens' Bulletins, Reports, Gardens Guide Book and Malayan Garden Plants series totalled \$404.80.

XXVIII. EXHIBITIONS AND SHOWS

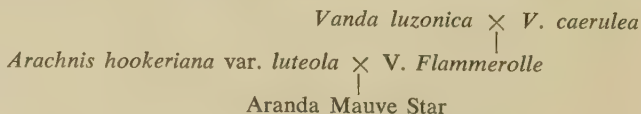
81. The Gardens participated in several shows during the year of which two were in the international class. A large consignment of orchid blooms and some aroids were sent to the Royal Horticultural Society's Annual Show held at Chelsea London in May. The staging of our display was arranged by Mr. Purseglove, who was on leave in England prior to retirement. Thanks for assistance are also due to Dr. R. E. Holtum and to Mr. L. Stenning, Curator, Royal Botanic Gardens, Kew. Though individual blooms were put up for awards, none was successful. The display as a whole however was awarded the Banksian Silver-gilt Medal for Gardens, Flowers and Ornamental Plants. Another larger consignment of orchids was sent to Hawaii for the Second World Orchid Congress in September. No award was won though blooms were entered for competition in four classes of cut flowers: Vandas, Dendrobiums, Other Genera and Collections. It must be noted that the Malayan Orchid Society was strongly represented at the Congress. Mr. Tan Chee Tong won awards for the best cut-flower Vanda and the best cut-flower Dendrobium in the show. These were Dend. Caesar (white) and V. Tan Chay Yan var. Ong Siew Hong, a dark brown sibling of this family.

82. The Gardens staged a non-competitive display at the Malayan Agri-Horticultural Association show in Kuala Lumpur in July. Three groups of plants, orchids, succulents and Saintpaulias were shown. Acknowledgement is due to the Ministry of Commerce and Industry for financial assistance which made it possible to take part in this show. Considerable interest was shown in the Federal Capital in the Gardens' plants and many enquiries and sales orders have resulted.

83. The annual flower show of the Singapore Gardening Society was held at the Happy World Stadium on 29th–31st March. Mr. G. H. Addison was honorary show manager and Mr. A. G. Alphonso honorary assistant show manager. Two big groups of orchids and succulents were exhibited. The Government House Domain competed in various classes and were awarded a number of prizes. The Department was awarded the prize for the best hybrid raised in Singapore. The plant exhibited was Vanda B.P. Mok var. Old Rose. The pedigree of this cross is:—



84. The first post-war orchid show by the Malayan Orchid Society also at the Happy World Stadium was held on 6–8th September. The Gardens gave considerable assistance in the way of pot plants and decorative material. Mr. J. L. Pestana was a member of the management committee for the show. The Gardens' exhibit of the largest group of orchids was one of the main attractions. The Department was awarded the prize for the best Malayan hybrid flowering for the first time. The plant was Aranda Mauve Star, whose pedigree is:—



85. In June the Gardens staged a demonstration in the Rotary Club of Singapore Hobbies Exhibition held in the Victoria Memorial Hall. The technique in its simplest requirements for growing orchids from seed was shown; also the way of collecting, preserving and mounting plants for a herbarium collection.

86. In conjunction with Messrs. QANTAS/BOAC orchids were sent for display in their stand at the Waratah Festival, Sydney, the Orchid Festival of New South Wales, Annual Show of the Victoria Orchid Club, Melbourne and the Pakistan Flower Show, Karachi. Blooms were also sent to the Commission of the Federation of Malaya in Sydney for the Federation Independence Day celebrations and to the Department of Publicity and Information, Wellington, New Zealand.

XXIX. SINGAPORE GARDENING SOCIETY

87. Several of the Society's monthly meetings were held in the Gardens and staff gave demonstrations and instruction to the members. One meeting was held in the vegetable garden attached to Government House by kind permission of His Excellency the Governor, Sir Robert Black. Mr. H. M. Burkill and Mr. A. G. Alphonso are both committee members of the Society for the current year.

XXX. MALAYAN ORCHID SOCIETY

88. The Society held two meetings in the orchid enclosure in the Gardens at which demonstrations were given by members of the staff. Mr. Addison and Mr. Pestana were members of the committee for 1957.

XXXI. MALAYAN AGRI-HORTICULTURAL ASSOCIATION

89. Members of the Gardens' staff contributed articles to the association's magazine. Mr. Purseglove was on the Committee up to 7th March and Mr. Burkill from 29th May. (See also para. 82).

XXXII. MALAYAN NATURE SOCIETY

90. The Society has an active Singapore branch which holds regular indoor and field meetings. Mr. Burkill led one field outing to the Pandan Reserve and was an 'available expert' on others. Mr. Purseglove was a committee member of the Society up to 7th March and was Chairman of the Singapore Branch up to 18th February. Mr. Burkill was a committee member of the Society from 12th July.

XXXIII. ADVISORY WORK

91. With senior staff almost entirely depleted for much of the year little outside advisory work was possible. With the exception of regular visits to Government House Domain only the most urgent needs of other official departments could be attended to. Advice and planting plans were drawn up for P.W.D. roadside tree planting at the 7 and 8 m.s. Thomson Road and on Tampenis Road near its junction with Changi Road. One hundred assorted

trees were supplied for the former and 72 *Filicium decipiens* for the latter. Visits and advice were also given to Raffles Girls' School, P.W.D. depot at Kallang, Singapore Infantry Regiment Barracks at Ulu Pandan and the Boy Scouts Camp at Jurong. Shortage of staff however did not prevent large numbers of the public, as always, calling at the office to seek advice on various horticultural subjects which was given wherever possible. Advisory correspondence was as abundant as ever. During the year 2,425 letters were received and 2,111 despatched.

APPENDIX I

STAFF OF BOTANIC GARDENS, 1957

		DIVISIONS I-III			
<i>Appointment</i>		<i>Name</i>			<i>Remarks</i>
Director		J. W. Purseglove, B.Sc. (Manc.), A.I.C.T.A., F.L.S.			Up to 7th March—retired under Malayanisation Ordinance.
		H. M. Burkill, M.A. (Cantab.), F.L.S.			From 8th March—Acting Agricultural Officer, Singapore from 26th June in addition to duties in the Botanic Gardens.
Assistant Director ..		H. M. Burkill, M.A. (Cantab.), F.L.S.			Up to 7th March.
		<i>Vacant</i>			From 8th March.
Keeper of the Herbarium		J. Sinclair, B.Sc. (Edin.)			
Botanists		C. X. Furtado, D.Sc. (Bomb.)			Re-engaged pensioner. On leave from 8th May to 13th November.
		Chew Wee Lek B.Sc. (Malaya)			Sent to Cambridge University to undertake higher studies on 18th September.
Curators		J. W. Ewart			Up to 25th March—retired under Malayanisation Ordinance.
		G. H. Addison			On leave from 30th April to 21st December.
		A. G. Alphonso			From 26th March.
Laboratory Assistant (Special Grade) ..		J. L. Pestana			
Librarian		Mrs. L. E. Lynas, M.A. (Cantab.)			Up to 30th June—resigned.
		<i>Vacant</i>			From 1st July.
Horticultural Assistant		A. G. Alphonso			Up to 25th March.
		<i>Vacant</i>			From 26th March to 30th June.
		Lam Hin Cheng			From 1st July. Sent to Royal Botanic Gardens, Kew, to study for the Kew Diploma on 24th September.
Herbarium and Museum Assistant ..		Haji Mohamed Nur bin Mohamed Ghous, B.E.M.			Re-engaged pensioner.
Laboratory Assistant		Bajuri bin Sappan			
Artist		Juraimi bin Samsuri			
Higher Clerical Officer		F. A. Pereira			
Clerks		V. d'Rozario			
		Miss C. W. Schelkis			Up to 13th November—transferred to Education Department.
		E. A. Scully			From 14th November—transferred from P.W.D.
Despatch Clerk ..		R. Raphael			
Stenographer ..		Miss Diana Foo Siew Lin			
Junior Horticultural Assistants		Wong Siew Hang			On duty in Government House Domain.
		Abdul Aziz bin Pakiri			
Storekeeper ..		Ismail bin Ahmad			

METEOROLOGICAL RECORDS

BOTANIC GARDENS, SINGAPORE 1957

Reading daily at 8 a.m. Local Time

ORCHID ENCLOSURE FROM 1-1-57

Month	Total Rainfall in.	Highest Fall in 24 hrs. in.	No. of days Rainfall	Mean Max. Temp. °F.	Highest Max. Temp. °F.	Mean Min. Temp. °F.	Lowest Min. Temp. °F.	Mean Dry bulb Temp. °F.	Mean Wet bulb Temp. °F.	Mean Relative Humidity per cent	Mean Min. Grass Temp. °F.	Mean Earth Temp. 4" °F.	Mean Earth Temp. 1' °F.	Mean Earth Temp. 4' °F.	Mean Daily hrs. Sunshine hrs.	Mean Solar Radiation °F.
January	4.61	1.62	14	86.7	89.5	71.8	69.8	74.0	73.4	96.3	69.6	79.3	81.9	82.5	4.32	141.4
February	4.17	2.31	8	88.0	90.2	71.8	69.5	73.9	73.2	96.8	69.5	80.0	82.2	83.0	5.60	144.3
March	7.71	1.07	14	88.0	91.5	73.4	71.5	75.5	74.9	96.4	71.4	80.3	83.0	83.8	4.56	141.7
April	3.64	1.54	10	89.3	93.0	74.5	73.0	77.1	76.2	96.0	71.4	82.3	84.1	84.1	5.09	145.4
May	12.21	4.28	17	86.7	90.5	74.8	73.0	78.4	77.4	94.9	71.6	81.7	80.7	84.1	3.59	141.4
June	2.65	0.75	10	87.6	91.0	76.2	72.5	78.2	77.1	94.9	74.7	82.8	84.2	84.2	4.55	140.5
July	8.53	3.26	17	87.7	90.5	74.0	70.8	76.9	75.9	95.5	73.3	80.3	83.0	84.3	4.35	139.4
August	4.60	1.00	15	86.0	90.0	73.9	71.5	76.6	75.7	96.3	73.6	80.8	83.3	83.7	4.55	137.1
September	9.29	1.08	18	85.9	89.0	73.9	69.5	79.9	76.0	95.7	73.6	81.0	82.9	83.6	3.87	135.7
October	2.22	0.62	15	86.9	90.0	73.7	72.0	76.8	75.7	94.9	73.3	81.9	83.9	83.9	5.20	142.2
November	6.89	1.77	22	87.7	91.8	73.3	70.5	76.3	75.5	96.4	72.5	81.3	83.7	84.2	4.44	137.5
December	11.98	1.68	25	84.5	88.5	73.1	70.5	75.4	74.7	97.0	73.4	80.3	81.8	83.3	2.45	134.2
Total or Mean	78.50	20.98	185	87.1	89.6	73.7	71.2	76.6	75.5	95.9	72.3	81.0	82.9	83.7	4.38	140.1

APPENDIX III

METEOROLOGICAL RECORDS

BOTANIC GARDENS, SINGAPORE 1957

Reading daily at 0200 hrs. G.M.T. = 9.30 a.m. Local Time

GARDENS OFFICE

Month	Total rainfall in.	Highest fall in 24 hrs. in.	No. of days rainfall	Average rainfall 1914-57 in.	Mean Max. Temp. °F	Highest Max. Temp. °F	Mean Min. Temp. °F	Lowest Min. Temp. °F	Mean Temp. dry bulb °F	Mean Temp. wet bulb °F	Mean Relative Humidity per cent
January	4.81	1.85	14	11.48	86.4	89.0	73.1	70.5	78.9	74.6	80.4
February	4.09	1.08	9	7.51	88.0	90.5	73.1	70.5	79.4	75.1	80.8
March	6.98	1.07	13	8.52	88.5	93.0	74.4	72.5	81.0	76.6	81.2
April	3.91	1.40	10	8.22	90.3	93.0	75.6	73.5	82.5	77.7	79.8
May	12.20	4.30	18	7.49	89.7	92.5	75.8	73.0	82.1	78.4	84.1
June	2.92	0.60	11	6.43	87.8	92.0	77.0	72.5	82.1	78.2	83.5
July	8.98	3.24	17	6.30	88.9	92.0	75.0	71.5	80.9	77.4	83.3
August	4.65	1.82	16	7.33	86.8	92.0	75.4	72.5	80.6	77.0	85.0
September	10.27	3.50	18	7.83	86.2	91.2	74.9	70.5	80.5	77.0	84.7
October	2.33	0.51	16	7.98	88.1	91.0	75.1	72.5	81.8	77.5	79.5
November	6.45	1.66	22	10.30	88.8	92.5	74.5	71.5	85.8	77.6	80.6
December	11.40	1.66	25	10.11	85.2	90.5	74.1	71.5	79.0	76.5	89.3
Total or Mean	78.99	22.69	189	99.50	87.9	91.6	74.8	71.9	81.1	77.0	82.7

APPENDIX IV

SUMMARY OF METEOROLOGICAL RECORDS, 1957

		<i>Gardens' Office</i>	<i>Orchid Enclosure</i>
Total Rainfall	..	78.99 in.	78.50 in.
Highest Fall in 24 hours ..	..	4.30 in.	4.28 in.
No. of days on which rain fell ..	..	189	185
Average rainfall 1914-57 ..	..	99.86	—
Mean Maximum Temperature ..	..	87.9°F.	87.1°F.
Highest Maximum Temperature ..	..	93°F.	93°F.
Mean Minimum Temperature ..	..	74.8°F.	73.7°F.
Lowest Minimum Temperature ..	..	70.5°F.	69.5°F.
Mean Temperature Dry Bulb ..	..	81.1°F.	76.6°F.
		at 9.30 a.m.	at 8 a.m.
Mean Temperature Wet Bulb ..	..	77.0°F.	75.5°F.
		at 9.30 a.m.	at 8 a.m.
Mean Relative Humidity ..	..	82.7%	95.5%
		at 9.30 a.m.	at 8 a.m.
Mean Minimum Grass Temperature ..	..	—	72.3°F.
Mean Earth Temperature 4 in. ..	..	—	81.0°F.
Mean Earth Temperature 1 ft. ..	..	—	82.9°F.
Mean Earth Temperature 4 ft. ..	..	—	83.7°F.
Mean Daily Hours Sunshine ..	..	—	4.38
Mean Solar Radiation ..	..	—	140.1°F.

APPENDIX V

INSTITUTIONS AND PRIVATE COLLECTORS FROM WHOM
PLANTS AND SEEDS WERE RECEIVED IN 1957

Australia	..	W. B. Muir, Queensland; Botanic Gardens, Adelaide; Botanic Gardens, Canberra; J. M. Frith, Boolaroo, N.S.W.
Bahamas	..	Mrs. A. Langlois, Nassau.
Barbados	..	H. H. Bayley, St. Michael.
Belgium	..	A. de Clereq & Fils, Gent.
Bermuda	..	Department of Agriculture, Paget East.
Brazil	..	Institute de Botanica, Parana.
Germany	..	University Botanic Gardens, Westfalen; University Botanic Gardens, Wuirzburg.
Hawaii	..	Makiki Nursery, Honolulu.
Holland	..	Botanic Gardens, Utrecht.
Hongkong	..	Urban Services Department.
Japan	..	Izu Experimental Station of Medicinal Plants, Shizuoka-ken; Onomichi Botanic Gardens, Hiroshima-ken; T. Satake, Hiroshima-ken; Osaka University.
Malaya	..	T.M.A., Singapore; City Council Nursery, Singapore; Nam Kee Nursery, Singapore; Mr. Koh Keng Hoe, Singapore; Mr. Boey Cheng Heng, Singapore; Mr. C. O'Hara, Perak; Hon. Mr. A. J. Braga, Singapore; Mrs. T. E. Allen, Kuala Lumpur; Mrs. L. V. Meeker, Singapore; Coronation Nursery, Singapore; Department of Agriculture, Kuala Lumpur; Mrs. Tan Chee Seng, Singapore; Mr. R. Scott, Singapore; Lady Black, Singapore, Seng Heng Nursery, Singapore; Mrs. H. K. Kuok, Johore Bahru; Mr. Chay Sing Hai, Singapore; Lady Scott, Singapore; Palas Gardens, Cameron Highlands; Botanic Gardens, Penang; Sq. Leader Stevens, Singapore; Manager Vallambrosa Estate, Kluang; Mr. Tan Chye Siam, Singapore; College of Agriculture, Serdang.

APPENDIX V—*continued.*

Mauritius ..	..	Botanic Gardens; Sugar Industry Research Institute.
Mexico ..	..	Gordon Ross, Chiapas.
New Guinea ..	..	Forest Department, Lae; Department of Agriculture, Stock & Fisheries, Port Moresby.
New Zealand ..	..	H. W. Johnston, Wellington.
South Africa ..	..	Botanic Gardens, Durban; National Botanic Gardens, Kirstenbosch.
Trinidad ..	..	Royal Botanic Gardens, St. Clair.
Uganda ..	..	Botanic Gardens, Entebbe.
United Kingdom ..	..	Royal Botanic Gardens, Kew; Dr. F. R. Irvine, London.
U.S.A. ..	..	Alex Hawkes, Florida; Dr. Payne, Detroit; Edwin Johnson, Florida; Division of Plant Exploration and Introduction Bureau, Maryland; U.S. Plant Introduction Gardens, Florida; N. J. de Leon, Florida, Mr. Barry, Los Angeles.
U.S.S.R. ..	..	University Botanic Gardens, Charkoviensis; Botanic Gardens Murmansk District.
Venezuela ..	..	Dr. Leon Croizat, Caracas.

APPENDIX VI

INSTITUTIONS AND PRIVATE COLLECTORS TO WHOM
PLANTS AND SEEDS WERE SENT IN 1957

Australia ..	..	Botanic Gardens, Brisbane; Botanic Gardens, Adelaide; J. M. Frith, Boolaroo, N.S.W.
Bahamas ..	..	Mrs. A. Langlois, Nassau.
Barbados ..	..	Mrs. H. H. Bayley, St. Michael.
Belgium ..	..	A. de Clereq & Fils, Gent.
Brazil ..	..	Horto Botanic Introduce, Parana.
Ceylon ..	..	Rubber Research Institute.
Cuba ..	..	G. Fowler, Havana.
Cyprus ..	..	Col. K. S. Hayes Palmer, B.F. P.O. 53.
Czechoslovakia ..	..	Research Institute of Fiba Plants, Temenice; Botanic Garden of Academy of Science, Kosice; Institute of Yang Natural Philosopherin Praqueq, Vysocany; David Vaclav Krasna Flora, Ultavou.
Egypt ..	..	Middle Egypt Botanic Station, El-Saft.
Fiji ..	..	Department of Forestry, Suva.
Finland ..	..	University Botanic Gardens, Turku.
Germany ..	..	University Botanic Gardens, Jena.
Gold Coast ..	..	Botany Department University College, Achimota; College of Technology, Kumasi.
Hawaii ..	..	Makiki Nursery, Honolulu.
Holland ..	..	A. Orloff Davidoff, Aalsmeer.
Hungary ..	..	Botanic Gardens, Szentes.
India ..	..	Legislative Assembly Secretariat, Calcutta; Indian Agricultural Research Institute, New Delhi; Mysore Government Gardens, Bangalore; Fruit Research Station, Saharanpur; National Botanic Gardens, Lucknow; Department of Agriculture, Hyderabad; Director of Horticulture, P.W.D., New Delhi.
Japan ..	..	University Botanic Gardens, Osaka; Izu-Experimental Station of Medicinal Plants, Shizuoka-ken; Miyakijima Weather Station, Tokyo; Kokuritsu Eisei Shikenjo Izu Bunjo, Shizuoka-ken; Onomichi Botanic Gardens, Hiroshima; Satake Engineering Co., Tokyo; Kyushu Regional Agricultural Experimental Station, Kagoshima Prefecture.

APPENDIX VI—*continued.*

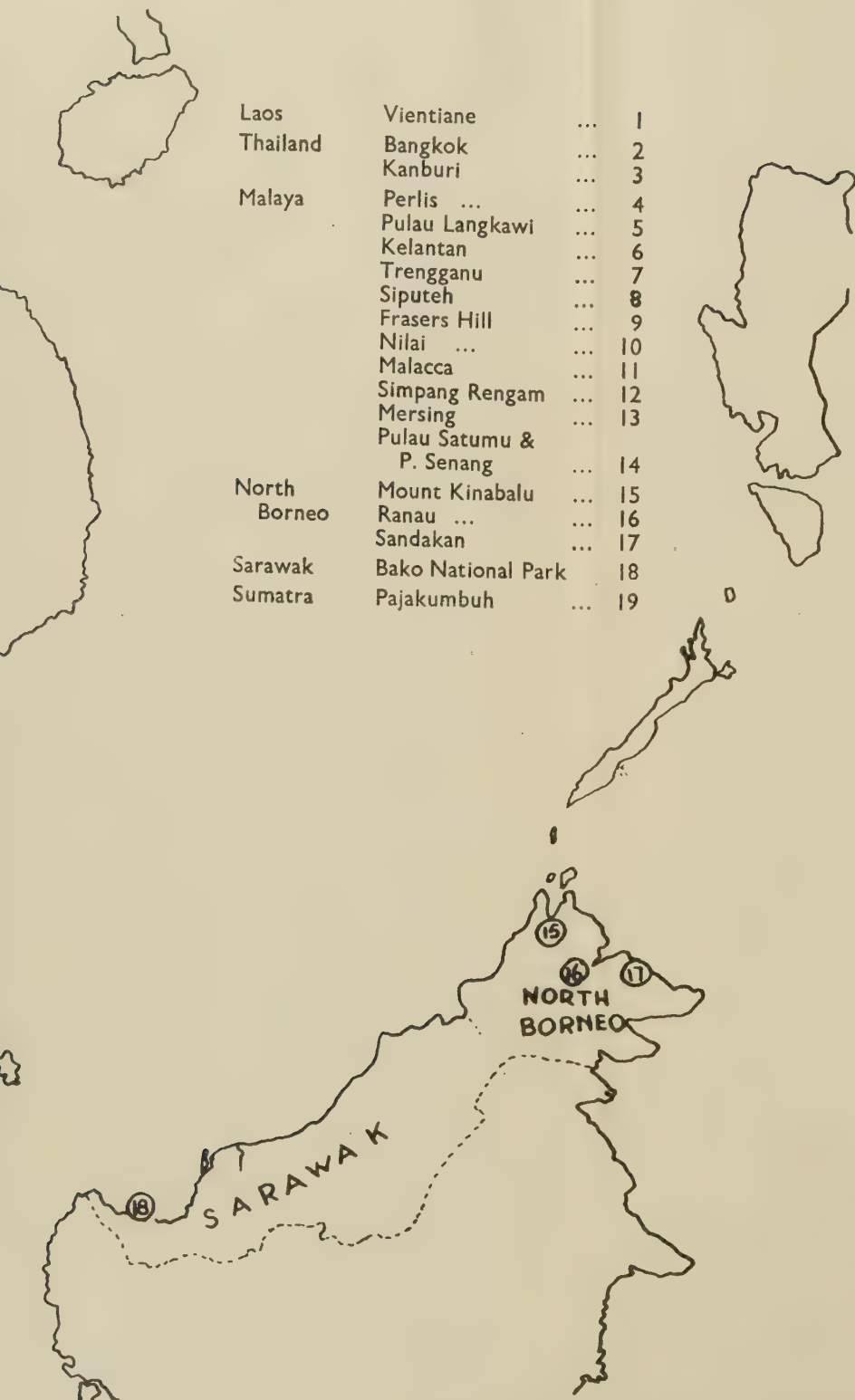
Jamaica	..	..	A. E. T. Vermont, Labyrinth P.O.
Kenya	..	..	Manager, Graham Bell Ltd., Nairobi.
Malaya	..	..	Department of Agriculture, Kuala Lumpur; Botanic Gardens, Penang, Forest Research Institute, Kepong and many private collectors.
Mexico	..	..	Senor Carlos Prieto, Mexico City; Gordon Ross, Chiapas.
New Guinea	..	..	Department of Agriculture, Port Moresby; Department of Forestry, Lae.
New Zealand	..	..	Fruit Research Station, Auckland; Botany Division Christchurch; Department of Agriculture, Cook Island.
Nigeria	..	..	Agricultural Department, Ilorin.
Samoa	..	..	Department of Agriculture, Apia.
Sarawak	..	..	Forest Department, Kuching; Survey Department, Miri.
Sicily	..	..	Giardino Allegra, Catania.
South Africa	..	..	E. H. Stein Transvaal; The University Pretoria.
Trinidad	..	..	Imperial College of Tropical Agriculture; Royal Botanic Gardens, St. Clare.
Uganda	..	..	Botanic Gardens, Entebbe.
United Kingdom	..	..	Department of Botany, Old Aberdeen; Royal Botanic Gardens, Kew; Royal Botanic Garden, Edinburgh; Botanic Gardens, Glasgow; F. W. Bartram, Nottingham; Major V. F. Howell, Surrey; C. Wright, Sheffield; D. Sanders, St. Albans, Herts.
U.S.A.	..	..	N. J. de Leon, Florida; Arnold Arboretum, Massachusetts; University of Tennessee; Mr. S. Leiberman, New Jersey; Mr. H. L. Hyland, Maryland; Mr. D. W. Smith, Texas.
Venezuela	..	..	Dr. Leon Croizat, Caracas.

A MAP SHOWING RE
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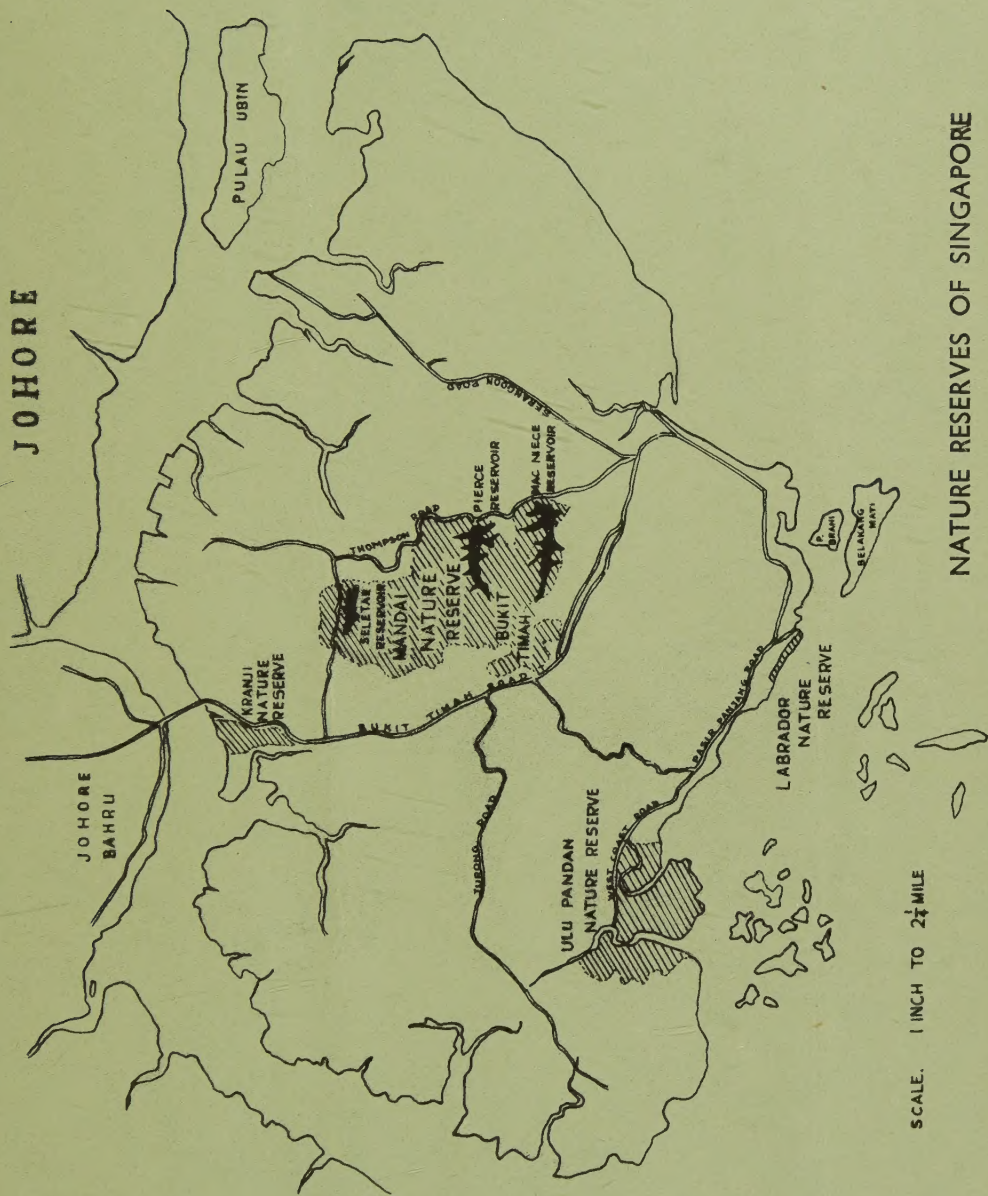


ONAL PLACE NAMES

THIS REPORT



JOHORE



SCALE. 1 INCH TO 2½ MILE

NATURE RESERVES OF SINGAPORE

